PATENT SPECIFICATION

736,814

Inventors : ERNST KREISSIG and OSKAR ERICH PETER

Date of Application and filing Complete Specification: December 3, 1952.

No. 30701/52.

Complete Specification Published: September 14, 1955.

Index at acceptance: —Classes 99(1), G22(C: F: H); and 99(2), J.

COMPLETE SPECIFICATION

A Releasable Pipe Connection or Pipe End Closure

We, RINGFEDER G.M.B.H., a German Company, of Duisburger Strasse 145, Krefeld—Uerdingen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a releasable pipe connection or pipe end closure which is especially suitable for gas-tight and liquid-tight connection of pipe joints, and wherein the connection can be released without deformation being caused to either pipes or connection.

Releasable pipe joints formed without welding and soldering are already known. For example, there is the so-called cutter ring pipe joint in which the said ring cuts partly into the pipes to be connected for the purpose of providing a leak-proof connection. However, this arrangement causes damage to the pipe and it is only possible to connect pipes having equivalent wall thicknesses unless, that is, additional packing material is used. In addition and particularly with pipe joints which are subject to shocks or vibrations, the cutting action can lead to faults. According to a further proposal, screwed pipe joints are provided with packing rings which are conical on both sides and which comprise internally and externally smooth, unslotted and continuous surfaces without transverse or longitudinal ribs. When tightening the screwed joints, the slight conical taper of such elements only permits a line contact between pipe and conical ring. In this way, there are produced local excessive stresses which lead to indentations in the pipe.

In addition there is lack of an effective bearing action over a sufficiently large surface. It is also known to obtain a pipe joint by using two locking nuts which operate through clamping rings on a split conical packing plug. Apart from the fact that this arrangement comprises many parts, there is not produced a complete bearing over the circumference of the packing plug, since the clamping rings only bear on a small surface thereof.

The high pressure connection according to the invention employs precision ring springs which include an annular outer spring member having a bevelled internal circumference and an inner spring member having a bevelled outer circumference. It is essential for the functioning of these rings that the material employed is one which ensures sufficient resilience so that when the spring members are relieved of tension they return to their pre-tensioned position; spring steel is employed. Due to the great resilience, there arises the advantage that pipes within the nominal constructional size can be connected or coupled in a gas-tight and liquid-tight manner, even when said pipes have high manufacturing tolerances, by axial loading of the ring springs, since the outer spring members are uniformly expanded radially and the inner spring members are compressed in a similar manner. When connecting a pipe joint, the individual clamping surfaces rest on one another with a high bearing pressure and the joint is secured in every respect. After the release of clamping nuts effecting the axial loading, the inner and outer spring members return automatically to their prestressed condition owing to the accumulated recoil energy, whereby the pipes can be easily exchanged. Consequently, the pipes can be assembled and dismantled many times with comparative ease. As already mentioned, an essential factor in this respect is the high resilience of the ring members since otherwise there is no guarantee that any existing irregularities of the pipe can be bridged when releasing the connection. It is also possible to make the ring members of a spring steel which resists corrosion, so that they may be used for pipes carrying acid and lye. It is not necessary to machine the pipes at the supporting surfaces when using steel pipe joints according to the invention, since due to the hardness of the steel being used, any existing irregularities in the pipe are plastically deformed and thus smoothed out owing to the high surface pressures occuring during clamping.

The ring members may have annular grooves for accommodating split rings in order to position accurately the ends of the pipes to be connected. Instead of the split

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rin . the said grooves may include packing de ces consisting of rubber or similar material for the purpose of providing a supplementary sealing action. It is also possible to clamp the pipe joint by means of a locking ring which engages the outer ring member through the intermediary of a screw thread. Moreover, the locking ring may cooperate with an inner bearing surface on an inner ring member. In a development of the underlying principle of the invention, but while retaining the use of the ring spring principle, it is readily possible to effect the union of threaded pipe sockets by using threaded pressure rings and threaded screws.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings, in which:—

Figure 1 shows the high-pressure packing element in longitudinal section,

Figure 2 is an end view of Figure 1,

Figure 3 is a plan view thereof,

Figure 4 is a longitudinal section of a high-pressure packing element for pipes having high manufacturing tolerances.

Figure 5 shows another constructional form of packing element,

Figure 6 shows in longitudinal section the use of a packing element on a pipe with a threaded socket,

Figures 7 to 9 show high pressure packing elements constructed to withstand relatively large stress,

Figure 10 is a section of a high pressure packing element utilized as a pipe-closing joint.

In the constructional example of the high pressure-packing elements shown in Figures 1 to 3 for the connection of, for example, smooth pipes, 1 is an inner annular ring member having a substantially triangular cross-section. At its centre the member 1 is formed with a semi-spherical annular groove 2 for accommodating a split ring 3 for the purpose of accurate spacing of the two pipe ends 4 relative to the centre of the packing element; the two pipes are inserted in opposite ends of the element. Two outer ring members 5 and 6 formed with inner bevelled faces and left-hand and right-hand threads 7 and 8, respectively, are mounted on the tapered surfaces of the inner ring member 1 and are held together as a unit by a locking ring 9 provided with left-hand and right-hand threads. Semi-circular millings 10 in the outer ring members 5 and 6 are adapted to receive a spanner for tightening purposes, while the clamping ring 9 is formed with suitable flats 11 also for tightening purposes by means of a spanner.

In the constructional example according to Figure 4, which comprises a pipe joint for pipes having high manufacturing tolerances, 12 represents adjoining inner ring members of annular configuration having outer bevelled circumferences at their adjacent end faces. These ring members are shaped to form inner and outer substantially semi-circular annular grooves 13, 14. The annular groove 13 serves to accommodate a split spacing ring 15 so that the two fitted pipe ends 16 and 17 are received in the packing element to an equal depth. Positioned in the annular groove 14 is a closed packing ring 18 which preferably consists of a buna rubber. The inner ring members 12 are united to form a complete unit by outer ring member 19, the threaded locking nut 20 and ring member 22 formed with an external thread 21.

Figure 5 shows a construction similar to that shown in Figure 4, but here two inner ring members 23 with a common semi-circular annular groove 24 accommodate a closed packing and spacing ring 25. The packing and spacing ring is made of rubber. The two inner ring members 23 are assembled to form a complete pipe joint by the threaded locking ring 26 formed with an inner conical surface as illustrated, in conjunction with outer ring member 22 which latter is externally threaded.

Figure 6 shows the connection of a pipe with a threaded socket in which an inner ring member 34 and an outer ring member 35 are both positioned in a blind bore 33 of a threaded pipe socket 32. A threaded locking nut 36 holds the two ring members 34, 35 together. The pipe to be connected is indicated at 37.

The constructional example shown in Figures 7 and 8 facilitates exchange of damaged piping. Figure 7 shows the locked pipe joint and Figure 8 displacement of the complete element beyond the point of connection, so that the adjacent pipe can be readily removed and a fresh pipe fitted. The pipe joint consists of two sets of ring springs each including an outer ring member 40 and an inner ring member 41. The outer ring members are supported against blind bores 42 of a locking ring 43, while the inner ring members are disposed adjacent clamping nuts 44. These clamping nuts 44 engage by means of their screw threads, a corresponding screw thread of the locking ring 43, whereby it is possible to tighten the ring members from both sides. With this packing element ends of the pipe are tapered, so that when they are fitted end to end an annular groove 45 is formed into which fits a split spring-like securing ring 46. The ring 46 partially engages an annular groove 47 formed in the locking ring 43, so that a displacement of the latter from the central position is inhibited. The annular groove 47 is of such

configuration that when one of the clamping nuts 44 is released and pressure exerted by hand on the locking ring 43 in a direction either to the left or to the right of the position shown in Figure 7, the ring 46 will spring outwardly from the annular groove formed by the ends of the pipes, so that the entire packing element can be displaced for the purpose of releasing one of the connected pipe ends. This condition is shown in Figure 8, in which the released pipe 48 can be readily removed and replaced. During this time, the high pressure packing element remains on the other pipe 48.

The constructional form shown in Figure 9 is concerned with high-capacity packing elements for gas or liquid conduits, which are under high pressure. Differing from the construction according to Figures 7 and 8, there are in this case several, for example, three, sets of ring springs arranged in series so that there is formed a series of packing surfaces one behind the other in the manner of a labyrinth packing. The ring members may be entirely similar or they may differ as regards external diameter and their taper. With the latter alternative, it is possible to produce a greater radial compressional effect and thus also greater packing effect. The fitting according to Figure 9 comprises a locking ring formed with an annular groove 49, a securing ring 50, two clamping nuts 51 and, on each side of the fitting, three sets of ring springs comprising spring members 52—53, 54—55 and 56—57 of different thickness and taper.

Figure 10 shows a constructional example of a releasable pipe end closure in which a male element 58 disposed within a pipe end 62, carries an inner ring member 59 and is formed at its upper end with an exterior screw thread and an internal hexagon to receive a spanner. A locking ring 61 engages the exterior screw thread on the male element 58, while the inner ring member 59 engages an outer ring member 60 in the manner shown.

What we claim is:—

1. A releasable pipe connection or pipe end closure, wherein outer and inner annular ring members formed of spring steel have inclined contacting faces to form a closed ring spring, said ring spring being adapted to circumscribe a pipe or a closure for a pipe, the arrangement being such that axial loading of said outer and inner ring members respectively will cause radial expansion and contraction thereof, to form a seal between the pipe and an outer sleeve or between the pipe end and the closure, and subsequent release of loading will cause the ring members automatically to return to their initial condition without deformation.

2. A pipe connection or pipe end closure according to Claim 1, wherein the inner ring member has an annular groove, which is preferably of semi-circular cross-section, for accommodating a split ring.

3. A pipe connection or pipe end closure according to Claim 1 or 2, employing at least two outer ring members, wherein the latter are formed one with a left-hand thread and the other with a right-hand thread and are adapted to be held together in conjunction with a single inner ring member, as a unit, by a locking ring with corresponding left-hand and right-hand threads.

4. A pipe connection or pipe end closure according to Claim 1, wherein two inner ring members are fashioned to form between them substantially semi-circular annular grooves for accommodating a spacing ring and a closed rubber ring, so that pipes with high manufacturing tolerances can be connected in liquid-tight and gas-tight manner.

5. A pipe connection or pipe end closure according to Claim 1, wherein the ring spring is enclosed by a locking nut and two clamping nuts, and the locking nut has an annular groove in which is disposed a spring ring intended to fit partly in an annular groove formed by bevelling the abutting ends of the pipes to be connected.

6. A pipe connection or pipe end closure according to Claim 1 or 5, wherein two series of ring springs are arranged in a locking nut, and wherein two clamping nuts are provided one on each end of the locking nut.

7. A pipe connection or pipe end closure according to Claim 6, wherein the ring springs have different external diameters.

8. A pipe connection or pipe end closure according to Claim 6 or 7, wherein the ring springs have different conical tapers.

9. A pipe connection or pipe end closure according to Claim 6 or 7 or 8, wherein the individual ring springs of the sets of such springs are made of different materials.

10. A pipe connection or pipe end closure according to Claim 1, wherein a closure member with an external screw thread and internal hexagon accommodate inner and outer ring members in conjunction with a threaded tightening ring.

11. A readily releasable pipe connection or pipe end closure, substantially as hereinbefore described and illustrated with reference to Figures 1 to 3, or 4, or 5, or 6, or 7 and 8, or 7, or 10 in the accompanying drawings.

Dated this 3rd day of December 1952.

HASELTINE, LAKE & CO.,
28, Southampton Buildings, London, W.C.2, England, and
19/25, West 44th Street, New York, U.S.A.,
Agents for the Applicants.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1955.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

736,814 COMPLETE SPECIFICATION
3 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

Fig. 1

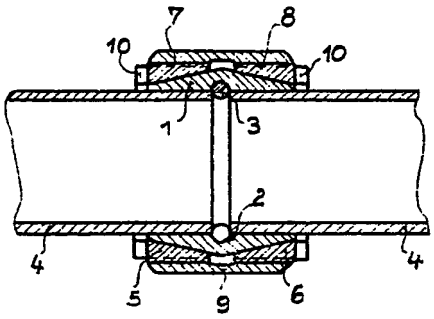


Fig. 2

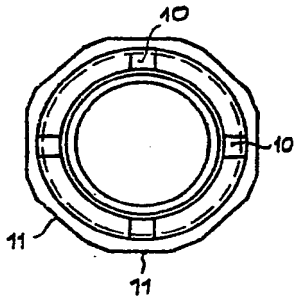


Fig. 3

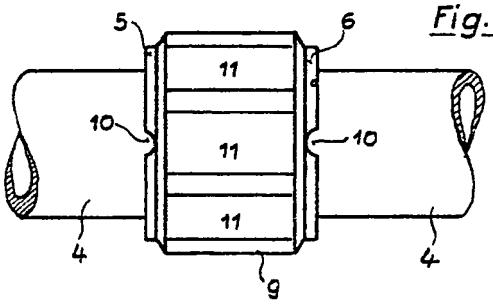


Fig. 4

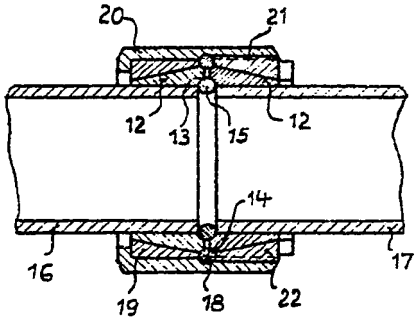


Fig. 5

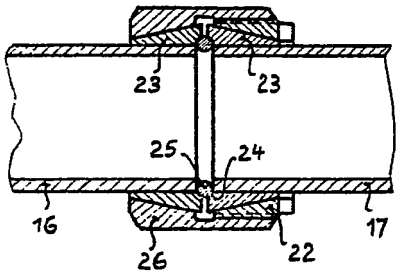


Fig. 6

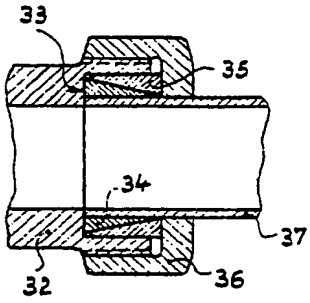


Fig. 7

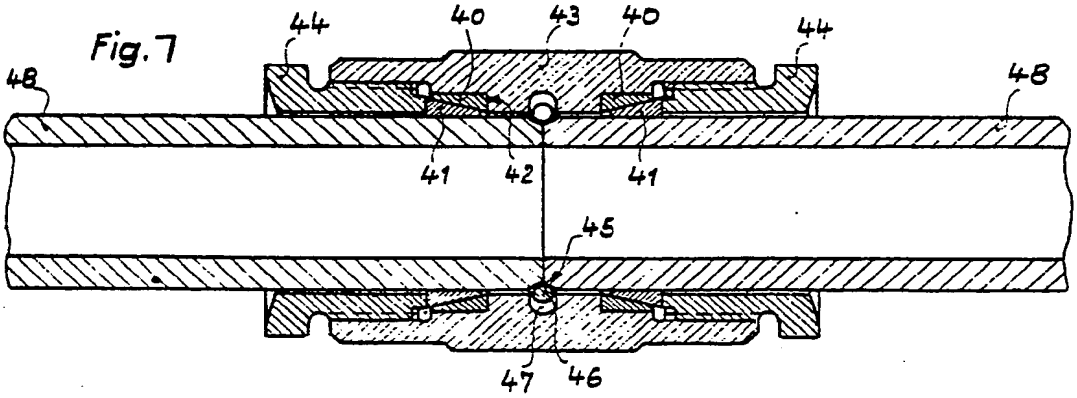
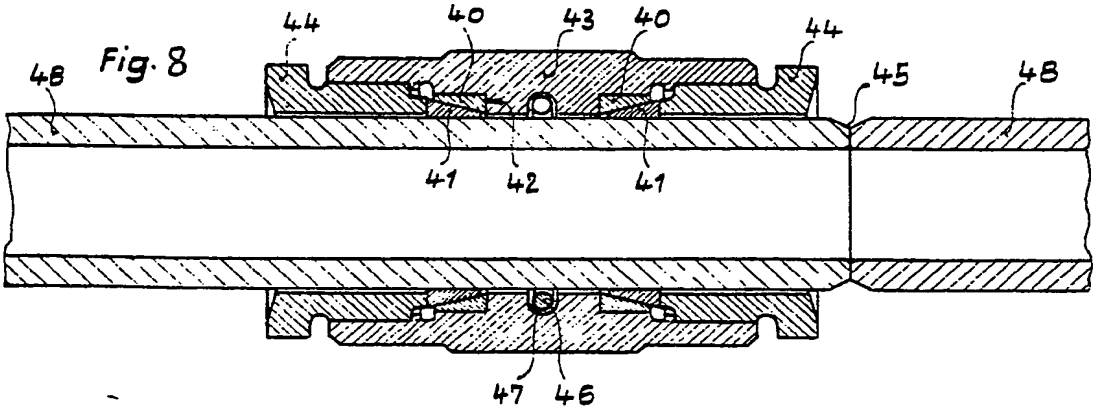


Fig. 8



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SHEETS 2 & 3

Fig. 10

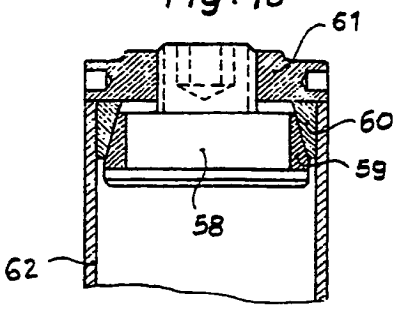
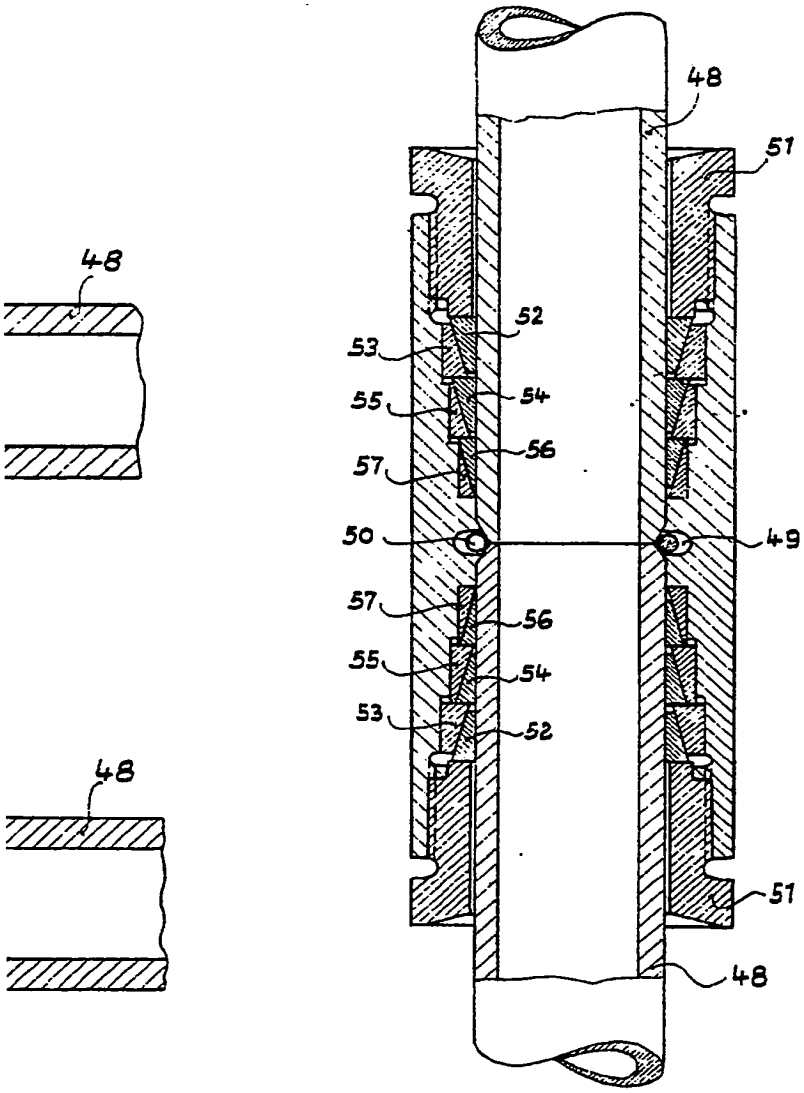


Fig. 9



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SHEETS 2 & 3

Fig. 6

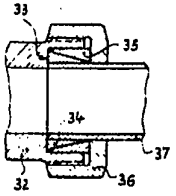

Fig. 7

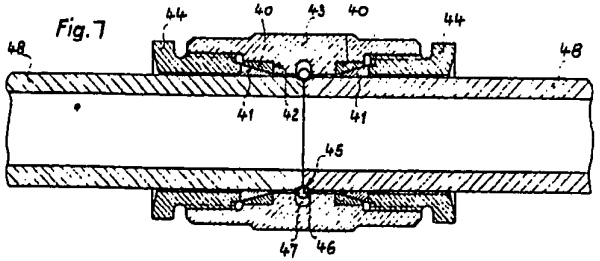

Fig. 8

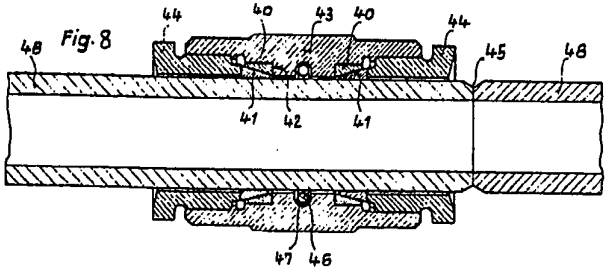

Fig. 9

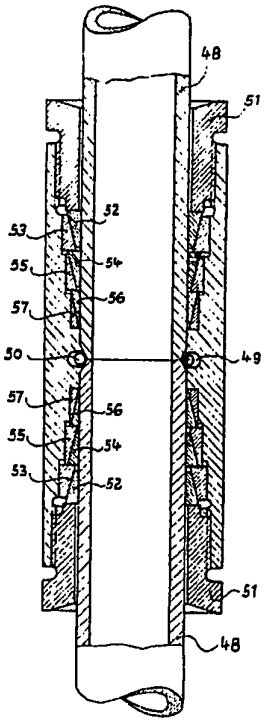

Fig. 10